

IN THE MATTER OF: RAYTHEON AIRCRAFT COMPANY.
Docket #RCRA 3008(h)-VIII-2000-17

Raytheon Final Decision
Former Beech Aircraft Corporation
Boulder, CO

INTRODUCTION

This is the RCRA Corrective Action Final Decision for the Raytheon Aircraft Company, former Beech Aircraft facility in Boulder Colorado. The purpose of the Final Decision is to identify the selected remedies for the Raytheon former Beech Aircraft facility. With the exception of the Remedy #6, Chemical Oxidation Treatment System for the Fort Hayes Limestone, all other selected remedies are continuations of interim remedial measures or corrective measures studies with demonstrated remedial effectiveness at the Raytheon facility. One of the Solar Chemical Oxidation treatment stations proposed in Remedy #6 has been constructed. At this time EPA is approving the implementation of all selected remedies.

Due to the complex geology under the site, contaminated groundwater does not leave the site. Contaminated groundwater in fractured bedrock is difficult to remediate in-situ. The objective of remedial activities at this site is to achieve on-site groundwater concentrations that will result in meeting Target Media-specific Cleanup Goal (TMCg) at the compliance wells through active remediation and monitored natural attenuation over time.

SELECTED REMEDY

1. Continue to operate the upgraded Interim Remedial Measure (IRM) systems.

a. Conversion of nine monitoring wells to groundwater extraction. There are six angle wells (HCA-50, HCA-82B, HCA-83, HCA-85, SVE-1B, and SVE-2B) and three vertical wells (HCA-10B, HCA-53, and HCA-69). The angle wells were selected to extract residual mass from underneath the Clean Room Annex (CRA) building and former surface impoundment. The three vertical monitoring wells HCA-10B, HCA-53 and HCA-69 were converted to extraction wells to enhance recovery of Volatile Organic Compounds (VOC). These nine dual-phase extraction wells are referred to as CRA system wells. Based on pilot testing conducted during the RCRA Facility Investigation (RFI), these wells were projected to significantly increase the amount of VOC recovered and to further mitigate the migration of VOC. Groundwater extracted from the CRA wells will be treated in the UV/OX treatment system.

b. Total Fluids Extraction (TFE) System. The TFE is three of five horizontal vent wells within the vadose zone under the CRA Building. Three horizontal wells (SVE-A, SVE-C and SVE-E) were installed approximately 15 feet bgs. The TFE wells were installed along the interface between the weathered bedrock and underlying competent bedrock to remove any perched water and to enhance the removal of VOC trapped in soils above the water table.

c. Conversion of monitoring wells HCA-77 and HCA-54A to groundwater extraction wells. HCA-77 contained significant concentrations of VOC and is located east of the Impoundment System in an area that received irrigation waters from the former surface impoundment. HCA-54A is located in the area where the CRA plume turns eastward and continues to follow the Unnamed Drainage. Extraction of groundwater from these wells was selected to enhance the removal of VOC emanating from the CRA area. Short-term pumping tests conducted at HCA-77 and HCA-54A in May 2002 suggested that rates of 0.5 to 1 gpm per minute could be achieved from each well.

2. Maintain Sub-Slab Depressurization (SSD) system under the Clean Room Annex.

The SSD includes installation of two of five horizontal vent wells within the vadose zone beneath the Clean Room Annex building for the removal of residual VOC and the mitigation of VOC into indoor air. Two of the horizontal wells (SVE-B and SVE-D) were installed at depths of approximately 8 feet below ground surface (bgs).

3. Enhanced Reductive Dechlorination (ERD) at Unnamed Drainage and boundary.

Enhanced reductive dechlorination (ERD) is an engineered bioremediation technique that exploits naturally-occurring biological mechanisms to treat chlorinated contaminants in situ. In practice, the technology involves amending groundwater with materials that stimulate natural systems to increase rates of contaminant degradation by optimizing geochemical conditions. When ERD is applied in a manner that establishes a zone of treatment through which groundwater flows, it is referred to as an in-situ reactive zone (IRZ) approach. A pilot study was conducted to determine the suitability of ERD in the Unnamed Drainage. The detection of cis-1,2-DCE, during the RFI suggested that partial reductive dechlorination of TCE had been occurring naturally. Detections of bromide and iodide tracers in Unnamed Drainage monitoring wells indicated that increased Total Organic Carbon (TOC) concentrations could be attributed to both the drainage ditch and injection well delivery methods. Monitoring results showed ERD is successful in completely degrading TCE to ethane and other light non-toxic hydrocarbons in three performance monitoring wells, PZ-2, HCA-25 and HCA-91. Complete degradation of contaminants occurred within 700 days from the initiation of ERD injections. Hydraulic connectivity between the Fort Hayes and the Smoky Hill Shale in the CRA area requires that only legs 3 and 4 of the ERD injection trench be used to address contamination in the Unnamed Drainage. Implementation of the ERD entails continued injections as needed into wells HCA-76A and HCA-76B, the infiltration trench, injection wells HCA-105A and HCA-105B and boundary wells (EW-10,EW-11, EW-12). Cumulative results from the pilot test suggest the ERD can reduce contaminant concentrations to Monitored Natural Attenuation levels at the compliance wells within three to five years.

4. Continue chemical oxidation treatment within the Target Missile Fueling Area (TMFA).

Results of the laboratory treatability testing indicated that chlorinated VOC in groundwater and in the bedrock are amenable to degradation using sodium permanganate. Twenty three wells are located in the TMFA zone. Sodium Permanganate solutions (4%, 10%, 12.5% and 14%) were either gravity or pressure injected into the 23 wells. In three of the wells (HCA-35, CA-73 and HCA-74B) contaminants of concern are below detection limits. Solar powered chemical oxidation treatment stations may be used as appropriate. The highest concentrations of remaining COCs are in wells HCA-36, HCA-56A, HCA-64, HCA-56A and HCA-75. Chemical oxidation will continue until the COC levels are at TMCG in the five wells with the highest concentrations listed above for a period of one year.

5. Implement a groundwater containment system within the Fort Hays Limestone.

During the Corrective Measure Study, a series of eight day pump and recovery tests were performed. The total duration of the pumping period was 42 days, a total of 160,822 gallons of groundwater was extracted and treated, and 448,000 water level measurements were collected and analyzed. The study concluded there were three hydrogeologic units or "blocks" in the Fort Hayes. The three blocks are the South Block, CRA block and East Block. The observed drawdown response from all three blocks was neither a simple Theis-type response or a smooth logarithmic decrease with distance from the well. The drawdown pattern is consistent with a conceptual block model. The three blocks respond differently but are hydraulically connected. Pumping from well HCA-117 resulted in a strong and relatively uniform drawdown response in wells within the CRA block, with weaker responses in the South and East blocks. Steady pumping from the Fort Hays at 2-3 gpm will result in groundwater containment within the CRA Block and lower the potentiometric surface at Seep 5 to below the ground surface elevation, eliminating surface discharge. Fluids produced by pumping will be treated in the UV/OX water treatment plant prior to discharge.

6. Implement a chemical oxidation treatment system within the Fort Hays Limestone.

In-situ chemical oxidation would be implemented as a pilot scale study to evaluate the effectiveness at reducing the concentrations of VOC within the Fort Hayes Limestone. The in-situ chemical oxidation treatment would include several injection treatments into selected monitoring wells screened within the Fort Hayes Limestone. One solar powered system is complete, additional systems will be constructed as appropriate. Final selection of the wells to be utilized would be determined based on the results from operation of the initial system. A chemical oxidation monitoring program for tracking the destruction of VOC in the groundwater would be initiated to evaluate the progress of treatments and determine the schedule for injections. After one year of operation, a meeting will be held with EPA to discuss an appropriate expanded implementation or cancellation of the of Fort Hayes Limestone Chemical Oxidation treatment.

7. Implement institutional controls: Access Restrictions: Land Use Restrictions, Deed Restrictions and Physical Restrictions.

Land Use Restrictions are legal restrictions on land use and activities such as excavation and development that may increase the potential for exposure to impacted soil and groundwater. An existing property covenant for this site precludes residential development or livestock grazing. Implementation of land use restrictions requires the concurrence of the property owner and issuance of permits by specific agencies based on the location and nature of the activities (i.e., trenching/excavation and irrigation) being performed. Permits for such activities would need to be obtained from the City of Boulder, State Water Resources Engineer, and the CDPHE. Permitting of such activities will include guidelines for screening soil and groundwater encountered during trenching or excavation activities and requirements for appropriate handling of contaminated materials. In addition, the existing property covenant prohibits the use of on-site groundwater for any purpose, thereby minimizing potential human exposure to impacted groundwater by on-site personnel.

Deed Restrictions are the placing of legal restrictions on the transfer or sale of a property. A legal annotation will be placed on the property deed to inform prospective buyers of the presence of potentially impacted soil or groundwater. Additionally, property use and installation of water supply wells will be restricted throughout the site. Deed restrictions require negotiations with property owners and the agencies involved based on location and the nature of the deed restriction.

Physical restrictions include the installation of additional perimeter fencing and signs in the Unnamed Drainage and Seep 5 areas to further ensure site security and limit public access. These physical restrictions will reduce trespassing and limit the number of persons potentially exposed to any contaminants present.

8. Continue site-wide groundwater monitoring and reporting until groundwater cleanup goals attained.

Compliance monitoring at the site will be conducted throughout remediation and continue upon completion of remedial measures. Compliance locations have been established to provide for protection of human health and the environment at locations representing potential direct exposure routes. The potential direct exposure routes associated with this facility are (1) indoor air in buildings adjacent to or overlying the VOC plume, and (2) groundwater naturally discharged to the surface off-site (i.e. groundwater seep locations). CDPHE has requested that the property boundary down gradient of the source areas must be considered a compliance monitoring location, and that groundwater at the property boundary will be required to meet TMCG for a final No Further Action determination.

Compliance monitoring locations for this site will include indoor air in occupied buildings; three natural groundwater discharge locations Seep 1, Seep 2 and Seep 5 and eight groundwater compliance monitoring wells ; HWS-1, HCA107A, HCA-107B, HCA-101, HCA-102B, HCA-111B, HCA-17 and HCA-87.

Compliance monitoring of the wells and Seeps will include measuring groundwater elevations, collecting general water quality parameters, (DO, oxidation reduction potential (ORP), pH, temperature, and conductivity), and collecting water samples for analysis of target VOC using EPA Method 8260.

Seeps 1 and 2 will be monitored semi-annually throughout active remediation of the Unnamed Drainage until TMGC have been achieved for two consecutive events. Upon achieving TMGC, Seeps 1 and 2 will be monitored annually for the duration of the Fort Hayes limestone groundwater pumping remedy for five years following cessation of groundwater pumping.

Seep 5 will be visually monitored monthly for a one year, followed by semi-annual monitoring throughout the duration of groundwater pumping.

Compliance monitoring of the wells along the eastern property boundary will be conducted semi-annually throughout active remediation at the site and continue until TMCG have been achieved for two consecutive events.

Subslab vapor monitoring will be continued at the current frequency of quarterly monitoring of emissions from the SSD System to ensure that the system is operating effectively in reducing potential human exposure with the overlying building. Indoor air monitoring will be conducted annually in occupied buildings not remediated by an SSD System or following shut down of the SSD System to ensure that exposures in those buildings do not pose a potential human health risk. Annual indoor air monitoring will continue until groundwater concentrations beneath a particular building are below levels that may result in indoor air concentrations that pose a human health risk.

In the event of a significant increase (one order of magnitude over the previous measurement) in VOC concentrations in indoor air, in any of the compliance wells or the performance wells, a meeting will be held with EPA to discuss an appropriate course of action.

PUBLIC PARTICIPATION

A public comment period was held August 13, 2008 through September 13, 2008. No comments were received.

FUTURE ACTIONS

The next step according to the EPA Corrective Action Order on Consent dated September 29, 2000 Section VIII Work to be Performed following receipt of this EPA Decision Document Raytheon Aircraft Company shall provide a Phase I and Phase II Corrective Measures Implementation (CMI) Work Plan with implementing schedules after receiving the EPA Decision Document.

The Phase I CMI Work Plan contents listed in the Order are conceptual design plan with specifications describing the size, shape, form and content of the proposed corrective measure; conceptual drawings and schematics; key components required; and the procedures and schedules required to implement the corrective measure.

The Phase II CMI Work Plan contents listed in the Order are implementing schedules containing an operation and maintenance plan, a final design and specification plan, a construction work plan, and an updated health and safety plan.

With the exception of Remedy #6, Chemical Oxidation Treatment System for the Fort Hayes Limestone all other selected remedies are continuations of interim remedial measures or corrective measures studies with demonstrated remedial effectiveness. One of the Solar Chemical Oxidation treatment stations proposed in Remedy #6 has been constructed.

The required contents for the Phase I CMI Work Plan were incorporated into the Corrective Measures Study Report (CMS Report), submitted March 2007. EPA is approving the Phase I CMI Work Plan incorporated into the CMS Study Report.

The required contents for the Phase II CMI Work Plan were incorporated into the Corrective Measures Study Report, with the following exceptions.

- a. Choice of Groundwater Performance Monitoring wells for each remedy selected including schedule of performance monitoring sampling for each remedy;
- b. Analytes and other parameters for each set of performance monitoring wells;
- c. Schedule of injections, concentration of permanganate solution and selection of injection wells in the TMFA Remedy #4;
- d. Schedule of ERD injections in the Unnamed Drainage and boundary Remedy #3; and
- e. Implementation schedule of wells to be tested in Remedy #6.

EPA will accept the above information as completion of the Phase II CMI Work Plan.

Subsequent to EPA's review and approval of the Phase II CMI Work Plan, EPA will make its Final Decision Document and Phase II CMI Work Plan available to the public in the local repository established pursuant to the Order.

DECLARATIONS

Based on the administrative record compiled for this corrective action, I have determined that the selected remedy to be required at this site is appropriate and will be protective of human health and the environment.



Date 9 October 2008

Sharon Kercher, Program Director,
RCRA/CERCLA Technical Enforcement Program
EPA Region VIII